
**बुल्स ट्रेन्च ईंट भट्टे का निर्माण —
दिशा निर्देश**

**Construction of Bull's Trench
Brick Kiln — Guidelines**

ICS 81.080; 91.100.25

© BIS 2019



भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुरशाह ज़फर मार्ग, नई दिल्ली – 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI-110002
www.bis.gov.in www.standardsbis.in

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Clay and Stabilized Soil Products for Construction Sectional Committee had been approved by the Civil Engineering Division Council.

Different types of kilns are being used for firing bricks. These kilns vary considerably in design, capacity and output. It is not infrequent to find two kilns of identical design located at the same place and yet producing bricks varying widely in quality. It has been found desirable that some degree of uniformity should be introduced in the design of kilns, so as to ensure the production of good quality bricks consistently with the minimum consumption of fuel. Works carried out by the CSIR-Central Building Research Institute, Roorkee and Punjab State Council for Science and Technology, Chandigarh and the information gathered from various manufacturers from various parts of the country, indicate that a broad outline can be furnished as a general guidance for their better performance.

The pollution caused by the brick kilns has drawn the attention of the Government and has resulted in many notifications on the subject, specifying the ceiling on the particulate matter concentrations emitted by brick kilns. This standard has been formulated in line with the various notifications and orders issued till date.

IS 4805 : 1978 'Guide for construction of brick kiln (*first revision*)', which covered the broad guidelines for the construction of Bull's trench brick kilns with moving chimneys, was withdrawn as the usage of moving chimneys in brick kilns were dispensed with by Government of India. This prompted the formulation of a new standard that covers the general guidelines for the construction of Bull's trench brick kilns with fixed chimney. This standard has been formulated to provide necessary guidance regarding construction of energy efficient Bull's trench brick kiln with fixed chimney to the manufacturers and users of these brick kilns.

The composition of the Committee responsible for the formulation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*). The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

CONSTRUCTION OF BULL'S TRENCH BRICK KILN — GUIDELINES

1 SCOPE

This standard gives the general guidelines related to the construction of Bull's Trench Brick Kiln with fixed chimney and gravitational settling chamber for the firing of bricks.

2 REFERENCES

The standards listed below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
456 : 2000	Plain and reinforced concrete — Code of practice (<i>fourth revision</i>)
1350	Methods of test for coal and coke
(Part 1) : 1984	Proximate analysis (<i>second revision</i>)
(Part 2) : 2017	Determination of gross calorific value by the bomb calorimetric method and calculation of net calorific value (<i>second revision</i>)
1893	Criteria for earthquake resistant design of structures
(Part 1) : 2016	General provisions and buildings (<i>sixth revision</i>)
(Part 4) : 2015	Industrial structures including stack-like structures (<i>first revision</i>)
1905 : 1987	Code of Practice for structural use of unreinforced masonry (<i>third revision</i>)
5182	Methods for measurement of air pollution: Part 1 dustfall (<i>first revision</i>)
(Part 1) : 2006	
11255	Methods for measurement of emissions from stationary sources
(Part 1) : 1985	Particulate matter
(Part 2) : 1985	Sulphur dioxide
17058 : 2019	Terms relating to brick kilns — Glossary

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 17058 shall apply.

4 NECESSARY INFORMATION

The following information should be furnished for efficient design and construction of the bricks kilns:

- Level of sub-soil water at the place where the brick kiln is required to be constructed;
- Slope of the ground and natural drainage;
- Type of soil with special reference to black cotton soil;
- Climatic conditions; and
- Siting guidelines, as applicable.

5 SITE

5.1 Floor Level

The floor level of the trench of the kiln should be above the ground level such that water naturally drains away from the kiln.

5.2 Sites with permanent water-logged areas should be avoided and if used, shall be appropriately treated.

5.3 Areas Susceptible to Natural Hazards

Site selection shall be done so as to minimize the risk against natural hazards. Areas likely to experience disasters such as frequent landslides shall be avoided for construction of kiln.

5.4 Sub-soil Condition

The sub-soil investigation of the site where chimney stands should be carried out and its foundation shall be designed accordingly.

5.5 Approach road within the premises of brick kiln area should be metaled or paved with brickbats. The kiln floor should be levelled and two layers of brick on edge may be laid on the floor.

6 CONSTRUCTION

6.1 Figure 1 shows a typical Bull's Trench Brick Kiln. It is a continuous, moving fire, annular kiln joined on the ends by two semi-circles in which the fire is always burning and moving forward in the direction of air flow

due to the draught provided by a chimney and the bricks are being pre-heated, fired and cooled simultaneously in different parts of the kiln. Fire moves in a closed circuit through the bricks stacked in the annular space between the outer and the inner wall of the kiln. It operates under the draught that is responsible for the distribution of heat inside the kilns.

The two types of draught are induced draught and natural draught. In forced or induced draught, a fan operating with minimum 50 mm water gauge (WG) draught, is provided to create the draught from the chimney whereas in natural draught, the chimney with sufficient height and cross-sectional area itself creates the required draught. The kiln is categorized into following two types based on its production capacity:

- a) *Large Bull's Trench Kiln*, having the production capacity equal to or more than 30 000 bricks per day — The height of the chimney shall be at least 30 m, in case of natural draught and 27 m, in case of induced draught when equipped with an induced draught fan operating with minimum 50 mm water gauge (WG) draught.
- b) *Small Bull's Trench Kiln*, having the production capacity less than 30 000 bricks per day — The height of the chimney shall be at least 27 m, in case of natural draught and 24 m, in case of induced draught when equipped with an induced draught fan operating with minimum 50 mm water gauge (WG) draught.

6.2 Salient Features of the Kiln

The various kiln components that allow the functioning of kiln for brick firing for making it energy-efficient and less pollution emitting are given in 6.2.1 to 6.2.6. The design of the kiln consists of the structurally safe design of these components so as to prevent air leakages and minimize heat losses.

6.2.1 Kiln Walls

Figure 2 shows a typical cross-section of the outer wall of the kiln. Outer wall of the kiln shall be designed in two leaves each having height at least 3m and forming cavity in between which should be filled by compacted earth or ash for improving thermal insulation and prevent the ingress of air in the kiln from the atmosphere. The mud plaster should be applied on both the sides of the outer wall. The heat loss and air leakage through the kiln wall depend on the wall thickness, thicker the wall, lesser is the heat loss through the walls.

Expansion joints should be provided in the Central Island wall, preferably in between every two side flues and on the inner side of the outer wall, preferably in between every two wicket gates.

6.2.2 Wicket Gate

Figure 3 shows a typical cross-section of the wicket gate wall. The width and height of the wicket gates shall be such that they allow for the passage, loading and unloading of vehicles in and out of the kiln. They

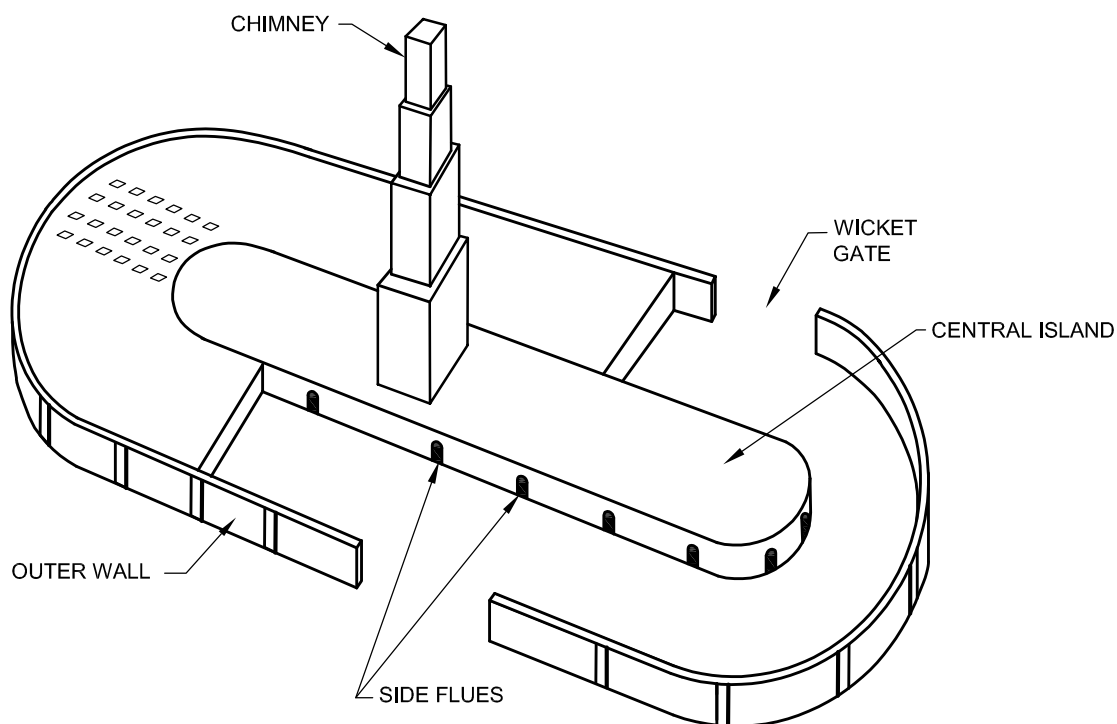


FIG. 1 TYPICAL BULL'S TRENCH BRICK KILN

should consist of two layers of brick wall each having thickness of at least 230 mm with a 100 mm gap in between, filled with ash or brick dust to minimize heat losses from wicket and air leakage into the kiln circuit through the wicket gates.

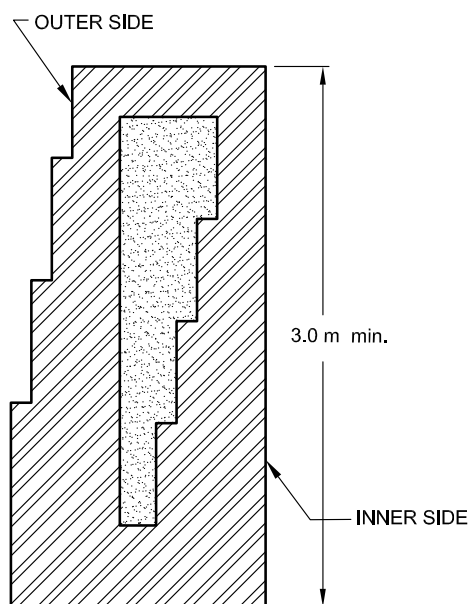


FIG. 2 TYPICAL CROSS-SECTION OF OUTER WALL OF KILN

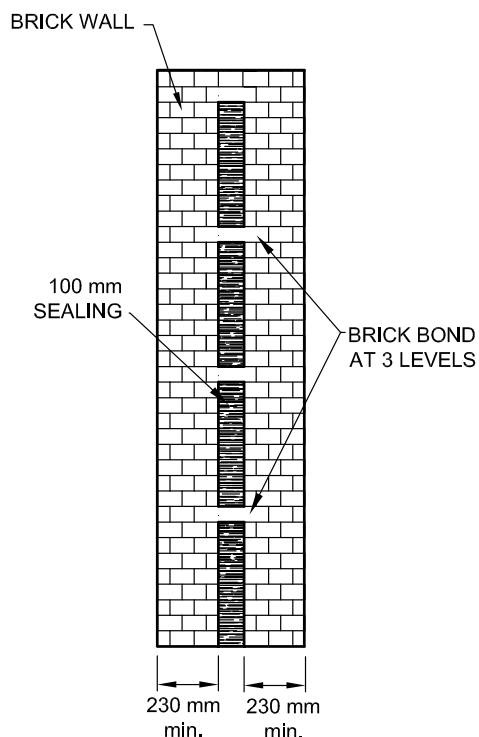


FIG. 3 TYPICAL CROSS-SECTION OF WICKET GATE WALL

6.2.3 Flue System

Flue system consists of two components namely, one main flue and many side flues. These flues connect the

kiln to the chimney and guide the flue gases to chimney through the flue system. The main flue runs throughout the length of Central Island on both the sides of chimney whereas the side flues are constructed at regular spacing at right angles to the main flue as shown in the Fig. 4A that connect the kiln to the main flue. Side flues are of L-shape that are open at their both ends - one into the kiln and other at the top surface of the Central Island. Adjacent to the opening of the side flues are the openings of main flues in the top surface of the Central Island. A shunt as shown in Fig. 4B is used to connect the main flue of the chimney with the side flues. The openings of the main flue and side flues in the Central Island that are not in use shall be suitably closed.

6.2.4 Chimney

The chimney, usually circular/rectangular in shape, and its different structural components namely foundation, beam, column, wall, etc. shall be designed in accordance with IS 456 or IS 1905 read in conjunction with IS 1893 (Part 1) and IS 1893 (Part 4) as per the chosen design and relevant site conditions. The outer surface of the chimney shall be plastered by the cement mortar while the inside of the chimney be plastered by mud. The height of the chimney shall be maximum of the following three heights:

- Minimum chimney height as given in 6.1.
- The chimney height (H_s), in metres, for the dispersion of sulphur dioxide, given by the formula $H_s = 14 Q^{0.3}$ where Q is sulphur emission rate, in kg/h measured in accordance with the test method laid out in IS 11255 (Part 2).
- The chimney height (H_{pm}), in metres, for dispersion of particulate matter, given by the formula $H_{pm} = 74 Q^{0.27}$ where Q is particulate matter emission rate in tonne/h measured in accordance with the test method laid out in IS 11255 (Part 1).

6.2.5 Gravitational Settling Chamber

It is a particulate collection structure consisting of baffles and fins constructed along the length of the kiln on either side of the chimney or at the base of the chimney connecting to all the flue inlets. The particulate matter is deposited at the bottom of the chamber which is then collected manually to dispose the waste.

Figure 5 shows the following three typical designs of gravitational settling chamber and their placement in the kiln:

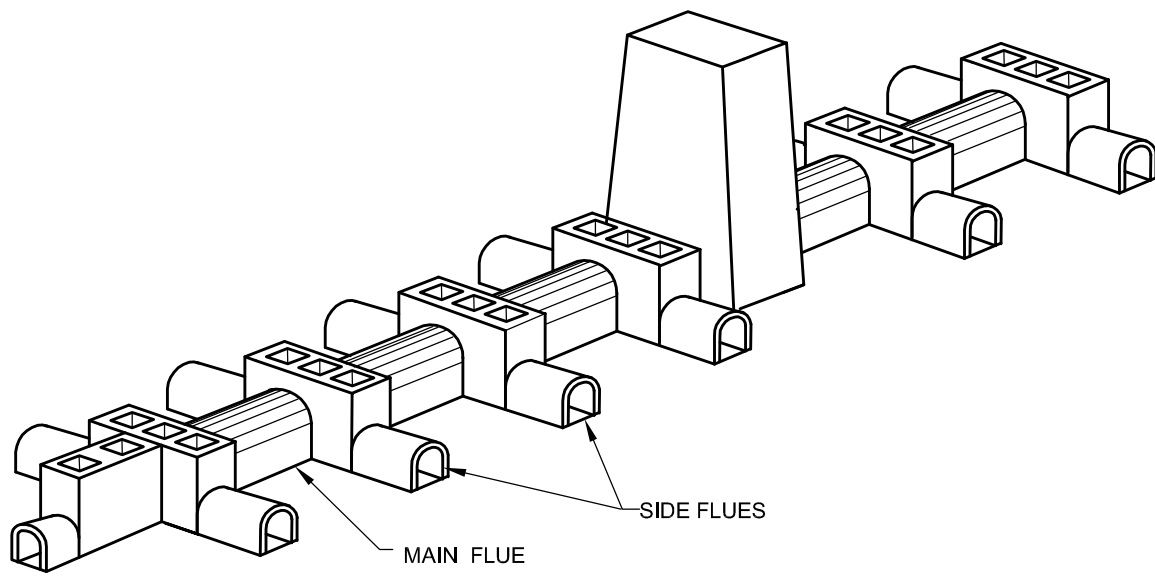
- PSCST Design (see Note 1 and Fig. 5A),
- CBRI Design (see Note 2 and Fig. 5B), and
- AMU Design (see Note 3 and Fig. 5C).

NOTES

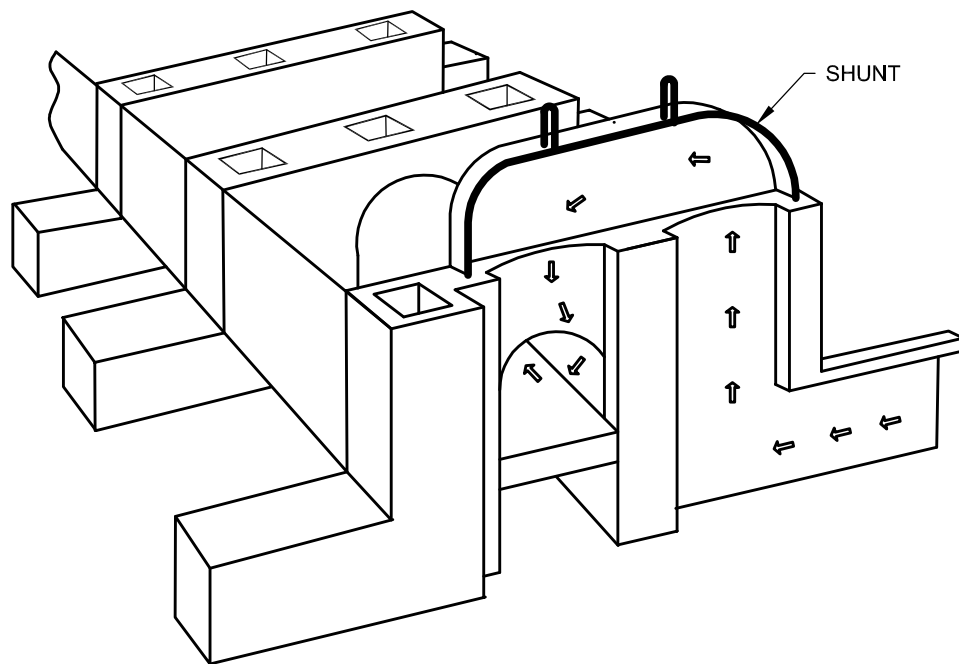
1 PSCST — Punjab State Council for Science and Technology, Chandigarh

2 CBRI — CSIR-Central Building Research Institute, Roorkee

3 AMU — Aligarh Muslim University, Aligarh

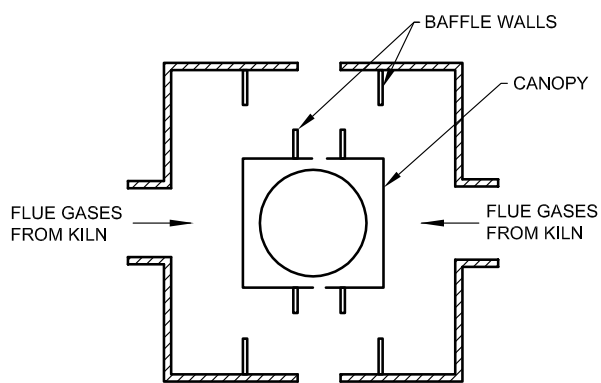


4A TYPICAL FLUE SYSTEM

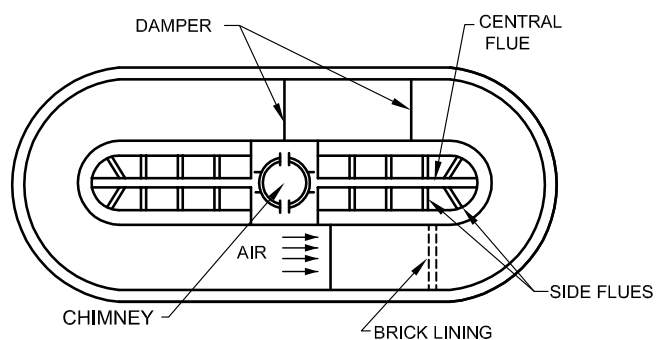


4B TYPICAL SHUNT CONNECTING MAIN FLUE WITH SIDE FLUE

FIG. 4 TYPICAL FLUE SYSTEM

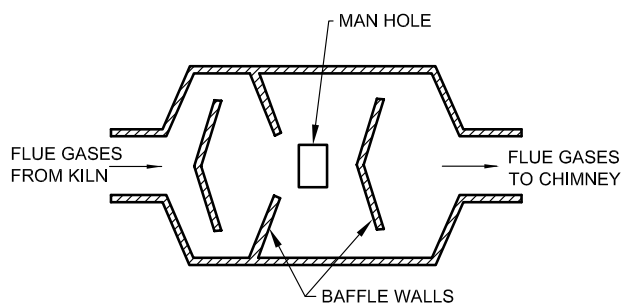


PSCST GRAVITY SETTLING CHAMBER

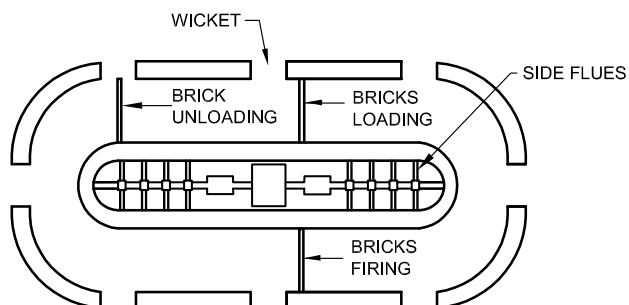


FIXED CHIMNEY BTK WITH PSCST GRAVITY SETTLING CHAMBER

5A TYPICAL PSCST GRAVITATION SETTLING CHAMBER AND ITS LOCATION IN THE KILN

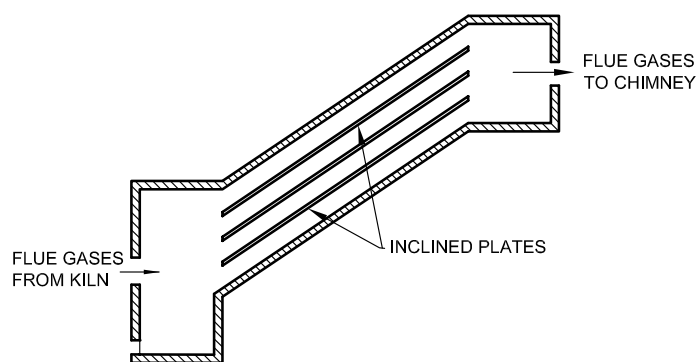


CBRI-ROORKEE GRAVITY SETTLING CHAMBER

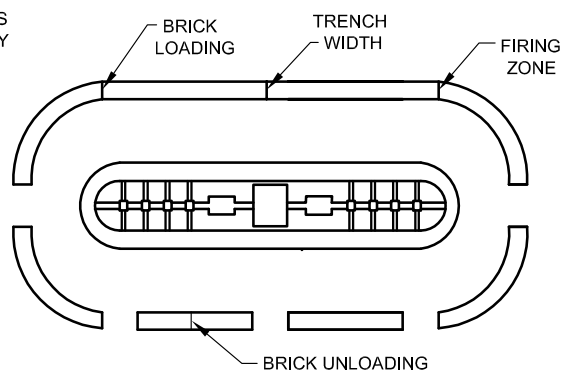


FIXED CHIMNEY BTK WITH CBRI GRAVITY SETTLING CHAMBER

5B TYPICAL CBRI GRAVITATION SETTLING CHAMBER AND ITS LOCATION IN THE KILN



AMU GRAVITY SETTLING CHAMBER



FIXED CHIMNEY BTK WITH AMU GRAVITY SETTLING CHAMBER

5C TYPICAL AMU GRAVITATION SETTING CHAMBER AND ITS LOCATION IN THE KILN

FIG. 5 GRAVITATIONAL SETTLING CHAMBER

6.2.6 Lightning Arrester

A lightning arrestor shall be provided at the chimney top to protect it from the damaging effects of the lightning.

7 PRINCIPLES OF OPERATION OF KILN

7.1 Figure 6 shows a typical arrangement of operations and firing zones in a Bull's Trench Brick Kiln. Bricks to be fired shall be stacked in the trench in a column and blade brick setting as shown in Fig. 7 that allows fire to flow in a straight line path as shown in the Fig. 8. A layer of ash and brick dust, preferably more than 250 mm should be spread over the top of the brick setting to seal the kiln to provide thermal insulation and prevent heat losses. The brick unloading end may be kept open for air to flow into the kiln. The brick loading end shall be sealed with the help of a damper to guide the flue gas to chimney through the flue system. The wicket gates in the kiln circuit shall be closed during firing. Fuel may be fed manually in the feedholes provided on the top of the kiln.

7.2 The kiln may be divided into three zones namely, cooling zone, pre-heating zone and combustion zone. In the cooling zone, (where fired bricks are cooled by the cold air flowing into the kiln) air entering from the unloading end picks up heat from the fired bricks resulting in heating of air and cooling of fired bricks. The next zone is combustion zone in which fuel is fed from the feedholes provided on the top of kiln. Fuel comes in contact with hot air and its combustion takes place in this zone. The last zone is the pre-heating zone (where green bricks are stacked) where heat available in the flue gases is utilized for pre-heating of green bricks. Fire movement takes place in the direction of air travel in the kiln.

7.3 Air is drawn in the kiln due to pressure difference in density of cold and hot air. The hot air in the chimney has lower density compared to the density of cold air in the atmosphere surrounding the chimney. The hot air flows up the chimney, creating a low pressure at the bottom of the chimney which helps in flow of cold air from the atmosphere that is at a higher pressure. Air enters from the unloading end of the kiln and flows through the kiln. The draught created provides the regular supply of air in the kiln. The chimney acts as a pump for sucking air in the kiln, which in turn supports fuel combustion.

8 GUIDELINES FOR BETTER FUEL CHARGING AND OPERATING PRACTICES

8.1 Fuel Storage

The fuel should be stored in a shed on a raised platform with *pucca*/metaled flooring and proper drainage and ventilation arrangements. The height of fuel stack

should not be more than 1.5 m to prevent the loss of heat due to self-ignition under intense heat and pressure.

8.2 Size of Fuel

The fuel charged should be properly graded and maximum size of fuel charged, in case of coal should be limited to 15 mm to ensure proper air-fuel mixing.

8.3 Fuel Quality

Fuels such as coal, fire wood and agricultural residues may be used. Pet coke, however, shall not be used. The assessment of fuels for their suitability of use for firing bricks shall be done on the basis of parameters namely, moisture content, ash content, volatile matter, fixed carbon and calorific value.

Proximate analysis and calorific value of fuel, in case of coal shall be determined in accordance with the test methods laid out in IS 1350 (Part 1) and IS 1350 (Part 2), respectively. Coal with high moisture content reduces calorific value and poses handling problems as well. Coal with high ash content leads to high stack emission and poses handling problems as well. Coal with low moisture content and ash content and high calorific value shall be used.

8.4 Fuel Feeding

Fuel should be fed in three rows of feedhole covers. The first row in the direction of fire travel should be in soaking stage which should be fed with sufficient quantity of fuel to maintain the temperature. The second row should have maximum fuel feeding and the third row should be fed with fuel to raise its temperature to an optimum level. Fuel charging in kilns should be done in small amounts using feeding spoon of 500 g to 600 g at regular intervals, preferably every 15-20 min with 10-15 min charging time or on continuous basis.

8.5 Brick Setting

Column of bricks should be stacked with proper and consistent gaps between them for laminar flow of fire travel, however at curves, the inner columns of bricks should be stacked tightly and the gap be increased between the brick columns gradually towards the end, as the inner length is less than the outer one in case of Bull's trench brick kiln, owing to its annular shape and fire tends to travel faster in the inner side leaving under-burnt bricks on the outer side. Number of brick columns may also be increased on the inner side of the brick setting.

8.6 Miscellaneous

Ash generated in the brick kilns should be fully utilized in-house in brick making. Feedhole covers shall be double walled and packed with insulation material. A temperature gauge shall be installed in the shunt and temperature in the firing zone should be regularly

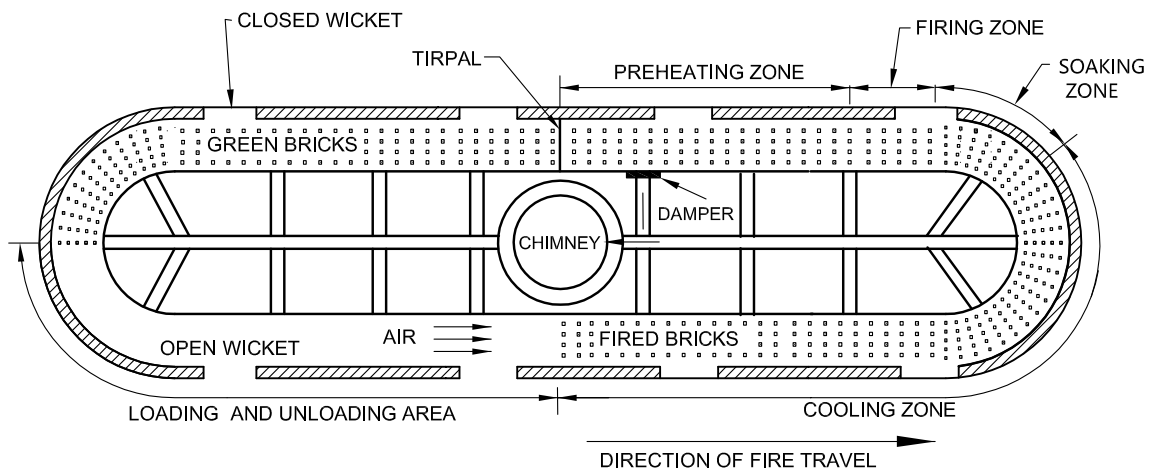


FIG. 6 TYPICAL ARRANGEMENT OF OPERATIONS AND FIRING ZONES IN A BULL'S TRENCH BRICK KILN

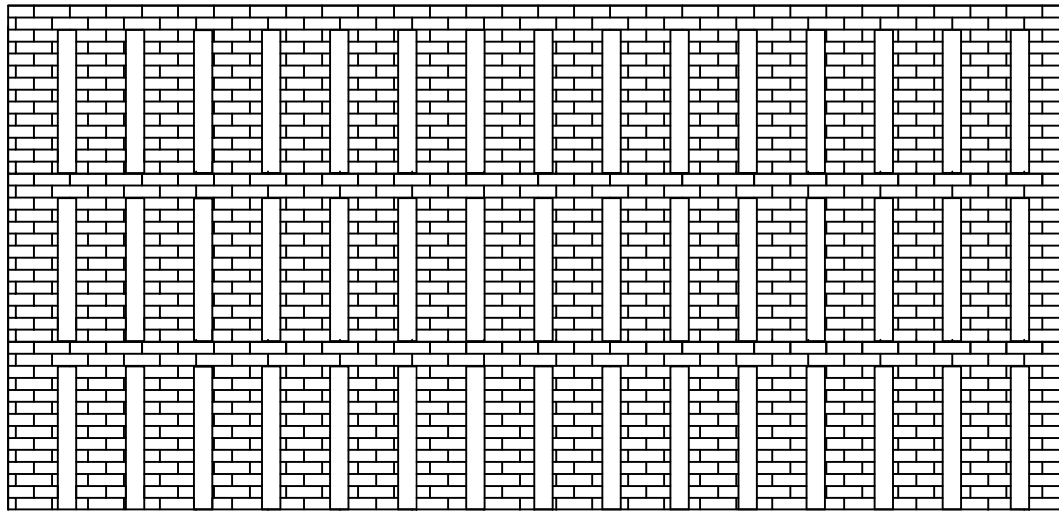


FIG. 7 TYPICAL COLUMN AND BLADE BRICK SETTING IN A BULL'S TRENCH KILN FOR STRAIGHT LINE AIR FLOW

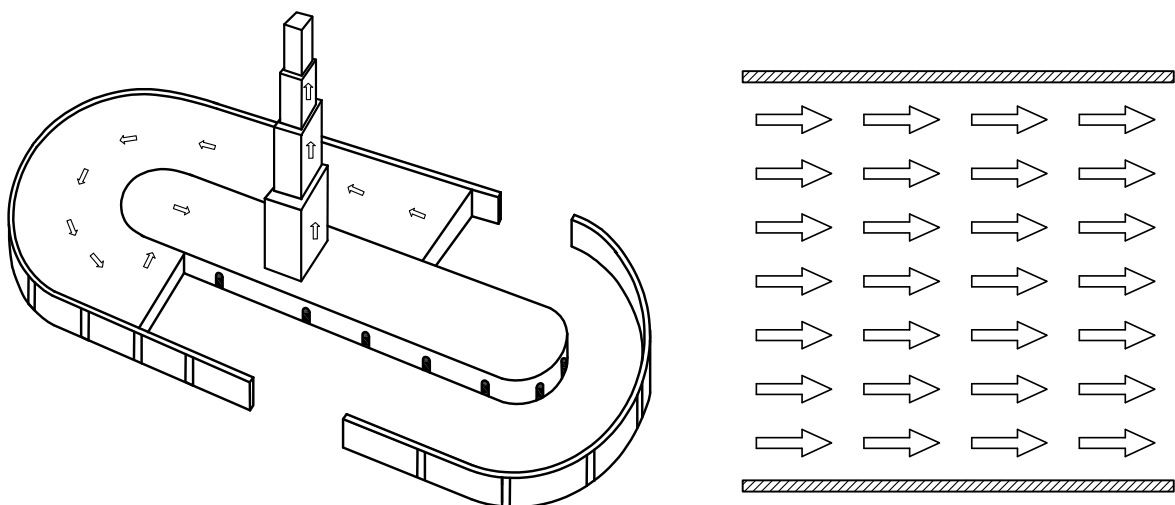


FIG. 8 TYPICAL PATH OF AIR FLOW IN BULL'S TRENCH BRICK KILN

monitored. Depending upon the type of the clay, baking temperature of the bricks in the combustion zone varies from 800-1 100°C.

9 POLLUTION MONITORING AT THE COMMISSIONED KILN

9.1 A permanent facility (sample port and platform) shall be constructed for the monitoring of emissions. The measurement of air pollution when carried out by the method specified in the relevant parts of IS 11255 (Part 1) or any other established instrumental/chemical method, shall not exceed the limits imposed by *Environment (Protection) Rules*, 1986, as amended

from time to time. In case of dispute, the procedure given in relevant parts of IS 11255 (Part 1) shall be the referee method. Pollution monitoring shall be carried out at different time slots for particulate matter and emission sample shall be a composite sample taken from both charging and non-charging conditions. Particulate Matter (PM) results to be normalized at 4 percent carbon dioxide (CO₂) as:

$$\text{PM (normalized)} = \text{PM (measured)} \times 4 \text{ percent} / \text{CO}_2 \text{ (measured) in percent}$$

9.2 Additionally, dust level may also be measured at 1 m and 3 m height from the bottom of the chimney in accordance with the method specified in IS 5182 (Part 1).

ANNEX A

(Foreword)

COMMITTEE COMPOSITION

Clay and Stabilized Soil Products for Construction Sectional Committee, CED 30

<i>Organization</i>	<i>Representative(s)</i>
CSIR-Central Building Research Institute, Roorkee	SHRI A. K. MINOCHA (<i>Chairman</i>)
All India Brick & Tile Manufacturers Federation, New Delhi	SHRI R. P. S. CHANDEL SHRI R. K. VERMA (<i>Alternate</i>)
Auroville Earth Institute, Auroville	REPRESENTATIVE
Building Materials & Technology Promotion Council, New Delhi	SHRI SHARAD GUPTA SHRI PANKAJ GUPTA (<i>Alternate</i>)
Central Pollution Control Board, New Delhi	SHRI B. VINOD BABU
Central Power Research Institute, Bengaluru	REPRESENTATIVE
Central Public Works Department, New Delhi	CHIEF ENGINEER (CSQ) SHRI MATHURA PRASAD (<i>Alternate</i>)
Central Soil and Materials Research Station, New Delhi	SHRI U. S. VIDYARTHI SHRI RAJ KUMAR (<i>Alternate</i>)
CSIR-Advanced Materials & Processes Research Institute, Bhopal	DR R. K. MORCHHALE DR MANISH MUDGAL (<i>Alternate</i>)
CSIR-Central Building Research Institute, Roorkee	SHRI A. K. MINOCHA SHRI L. P. SINGH (<i>Alternate</i>)
CSIR-Central Glass & Ceramic Research Institute, Kolkata	DR PARVESH AGRAWAL SHRIMATI ASHA T. ANIL (<i>Alternate</i>)
CSIR-North-East Institute of Science and Technology, Jorhat	DR PINAKI SENGUPTA
Delhi Development Authority, New Delhi	CHIEF ENGINEER (DESIGN) SHRI LACHHMAN SINGH (<i>Alternate</i>)
Delhi Metro Rail Corporation, Delhi	SHRIMATI PAPIYA SARKAR
Development Alternatives, New Delhi	DR SOUMEN MAITY SHRI PALAS KUMAR HALDAR (<i>Alternate</i>)
Gujarat Engineering Research Institute, Vadodara	SHRI B. M. RAO SHRI KAMALANAYAN L. DAVE (<i>Alternate</i>)
Hindustan Construction Company Ltd, Mumbai	SHRI SATISH KUMAR SHARMA SHRI RAJIV SUREKHA (<i>Alternate</i>)
Housing and Urban Development Corporation Limited, New Delhi	SHRI AKHILESH KUMAR SHRI SURENDRA KUMAR (<i>Alternate</i>)
Indian Institute of Science, Bengaluru	PROF B. V. VENKATARAMA REDDY DR K. S. NANJUNDA RAO (<i>Alternate</i>)
Int Nirmata Parishad, Varanasi	REPRESENTATIVE
Military Engineer Services, Engineer-in-Chief's Branch, Integrated HQ of MoD (Army), New Delhi	SHRIMATI UPINDER KAUR SHRI M. A. RUPEREE (<i>Alternate</i>)
Ministry of Science & Technology, New Delhi	SHRI RAJ KUMAR JOSHI SHRI PAWAN KUMAR (<i>Alternate</i>)
National Building Construction Corporation, New Delhi	SHRI ANIL MALLA SHRI M. K. CHAWLA (<i>Alternate</i>)

<i>Organization</i>	<i>Representative(s)</i>
National Test House, Kolkata	SHRI D. V. S. PRASAD SHRI NARESH GUPTA (<i>Alternate</i>)
NTPC Ltd, Noida	SHRI JITENDRA KUMAR SHRI MOHIT JHALANI (<i>Alternate</i>)
Public Works Department, Chennai	SUPERINTENDING ENGINEER EXECUTIVE ENGINEER (<i>Alternate</i>)
Punjab State Council for Science and Technology, Chandigarh	SHRI PRITPAL SINGH SHRI MAGANBIR SINGH (<i>Alternate</i>)
Shriram Institute of Industrial Research, Delhi	DR MUKESH GARG SHRI RABINDRA KUMAR JENA (<i>Alternate</i>)
The Energy and Resources Institute, New Delhi	SHRI SACHIN KUMAR SHRIMATI SUDIPTA SINGH (<i>Alternate</i>)
Unique Engineering Testing & Advisory Services, Surat	SHRI HITESH DESAI SHRI NEHAL H. DESAI (<i>Alternate</i>)
Wienerberger India Private Ltd, Bengaluru	SHRI KUNDAN B. DIGHE SHRI D. J. JAGADEESHA (<i>Alternate</i>)
In personal capacity (651/37 Ganga Enclave, Sainik Colony, Roorkee 247667)	DR J. M. BHATNAGAR
BIS Directorate General	SHRI SANJAY PANT, SCIENTIST 'F' AND HEAD (CIVIL ENGINEERING) [REPRESENTING DIRECTOR GENERAL (<i>Ex-officio</i>)]

Member Secretary

SHRI MILIND GUPTA
SCIENTIST 'C' (CIVIL ENGINEERING), BIS

Working Group for Brick Kilns, CED 30/WG 1

<i>Organization</i>	<i>Representative(s)</i>
CSIR-Central Building Research Institute, Roorkee	SHRI A. K. MINOCHA
Punjab State Council for Science and Technology, Chandigarh	SHRI PRITPAL SINGH SHRI MAGANBIR SINGH (<i>Alternate</i>)
The Energy and Resources Institute, New Delhi	SHRI SACHIN KUMAR

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 2016* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

This Indian Standard has been developed from Doc No.: CED 30 (12335).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002

Telephones: 2323 0131, 2323 3375, 2323 9402

Website: www.bis.gov.in

Regional Offices:

Telephones

Central	: Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110002	{ 2323 7617 2323 3841
Eastern	: 1/14 C.I.T. Scheme VII M, V.I.P. Road, Kankurgachi KOLKATA 700054	{ 2337 8499, 2337 8561 2337 8626, 2337 9120
Northern	: Plot No. 4-A, Sector 27-B, Madhya Marg CHANDIGARH 160019	{ 265 0206 265 0290
Southern	: C.I.T. Campus, IV Cross Road, CHENNAI 600113	{ 2254 1216, 2254 1442 2254 2519, 2254 2315
Western	: Manakalaya, E9 MIDC, Marol, Andheri (East) MUMBAI 400093	{ 2832 9295, 2832 7858 2832 7891, 2832 7892

Branches : AHMEDABAD. BENGALURU. BHOPAL. BHUBANESHWAR. COIMBATORE.
DEHRADUN. DURGAPUR. FARIDABAD. GHAZIABAD. GUWAHATI.
HYDERABAD. JAIPUR. JAMMU. JAMSHEDPUR. KOCHI. LUCKNOW.
NAGPUR. PARWANOO. PATNA. PUNE. RAIPUR. RAJKOT. VISAKHAPATNAM.

Published by BIS, New Delhi